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ABSTRACT

This paper identifies aspects of information flow that are affected by online provision of internal information. Reference is made to four case studies of Western Australian government agencies' steps toward becoming Internet information providers, and to the lessons learned from their experiences. Three key interdependent elements of organizational information infrastructure or capability for Internet information provision as identified by the case studies are: organizational structure and processes; information technology infrastructure; and information management infrastructure. The paper concludes with the following recommended strategies for managers to prepare their organizations to become online providers of internal information: (1) develop in managers an understanding of the new information and business environment; (2) develop managerial, professional and operational staff understanding of the organizational role of computer-based communication media; (3) re-engineer business processes whose end-product is information provision; (4) develop policies and procedures for management of online information about the organization; and (5) provide appropriate staff with suitable information technology and skills for online information access and provision. (Contains 12 references.) (AEF)

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Information Infrastructure: Organisational Capability for Online Information Provision

By:

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Information infrastructure: organisational capability for online information provision

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Abstract: *The World Wide Web (WWW) enables all organisations to become online information providers. For many organisations, the information provided will come not from external, published sources (the traditional source of online information) but from internal sources. Information formerly provided to external customers and clients (and to prospective customers and clients) during face to face meetings, from telephone information services, and through printed reports, brochures and publications, can now be provided online and made available locally and internationally on the Internet. Internal information formerly provided to internal staff in print form can now be provided online using WWW and related technologies to develop an intranet. Use of online media for provision of information from internal sources has repercussions for the organisation's information infrastructure. Successful online provision of internal information requires organisational, information technology and information management capability. From an organisational point of view, the key issues to be resolved concern organisational structure and information management rather than the technology itself. Online provision of internal information has the potential to affect the information flow massively, and therefore the structure and operation of an organisation. This paper identifies aspects of information flow that are affected by online provision of internal information, and recommends strategies for building organisational capability for online information provision.*

Keywords: Information infrastructure, intranets, Internet, World Wide Web, information provision, organisational capability

1. Online provision of internal information

The Internet is becoming widely accepted by businesses and government agencies as a tool for communication with clients, customers and members of staff (Refs 1, 2). The World Wide Web (WWW) was established to provide a method of sharing information in many formats between colleagues in many locations (Ref 3). Its success has led to its rapid growth as a medium for transfer of commercial and research information. The WWW and related technologies enable all organisations to become online information providers. Information once provided to external customers and clients (and to prospective customers and clients) during face to face meetings, from telephone information services and through printed reports, brochures and publications, can now be provided online and made available locally and internationally on the Internet. The opportunities for external information provision using the networks range from electronic publication of public relations and educational material to service provision.

Internet protocol technology can also be used to support electronic mail, distribution of policies and procedures, and file sharing within an organisation. Systems that use Internet protocols for internal information provision are called 'intranets' (Ref 4). Internal information formerly provided to internal staff in print form can now be provided online using WWW or groupware technology such as Lotus Notes to develop an intranet (Refs 4–6). Within organisations, price lists, policy and procedure manuals, acts with by-laws and other documents that are frequently updated and widely distributed can be made available electronically for people to consult as needed. For example, an electronic master copy of a policy manual can be maintained in an area accessible to all members of an organisation's staff connected to the network. Instead of printing updates or new copies of the manual each time a change is made, the master is updated with each change as it is approved. Each time members of staff consults the electronic master, they — and the organisation — can be assured that they are using the current procedure. Updates are more frequent and the chances of using outdated information are significantly reduced. Only one copy need be maintained (with appropriate backup). The cost of printing and distribution is reduced significantly.

Researchers who have looked at how the Internet is used to gather information at work have found that it quickly becomes part of day-to-day working life for people who have access to it. Internet information resources

are incorporated into work as easily as other working tools such as the telephone, the computer and the library (Refs 7–9). Use of the Internet and related technologies for information gathering can also fit readily into current organisational structures and practices. It is not so easy, however, for Internet information provision to be incorporated into an individual's day-to-day work or organisational structures and practices.

This paper identifies key components of organisational capability for online provision of internal information. Reference is made to four case studies of Western Australian government agencies' steps toward becoming Internet information providers, and to the lessons learned from their experiences. The paper concludes with recommended strategies for managers to prepare their organisations to become online providers of internal information.

2. Information infrastructure

'Information infrastructure' is a term used to describe the underlying information technology and telecommunications services that permit transfer of data between computers. The transferred data may include text, video, sound and other digitised media. Use of the term 'information infrastructure' to describe information technology and telecommunications services does not ensure that information is part of the infrastructure. Information infrastructure is the infrastructure that permits information to be transferred effectively. It therefore includes not just information and telecommunications technologies, but services, and organisational structures and processes that support effective information transfer.

Most discussion of information infrastructure has centred on the global information infrastructure of the 'information superhighway', of which the Internet is part (see, for example, Ref 10). National and local information infrastructures that are part of the Internet are also part of the global information infrastructure. The term 'global information infrastructure' will be used in this paper to describe the information infrastructure that permits an organisation to provide information to people outside the organisation, and to transfer information among people within the organisation but in different geographical locations.

The global information infrastructure is powerful because it permits information to be transferred between remote locations, without the need for synchronisation of the sending and receipt of information. The time and place matrix (Figure 1) illustrates the advantages of communication using the global information infrastructure. People can communicate with each other regardless of their physical location. Their communication can occur in real time or can be delayed to meet business requirements, differences in time zones, differences in work habits or simply personal preference.

While the global information infrastructure is essential if an organisation is to communicate effectively with people and organisations outside its boundaries, the organisation itself needs an information infrastructure if it is to be a successful online provider of internal information. The remainder of this paper considers organisational capability for online provision of internal information.

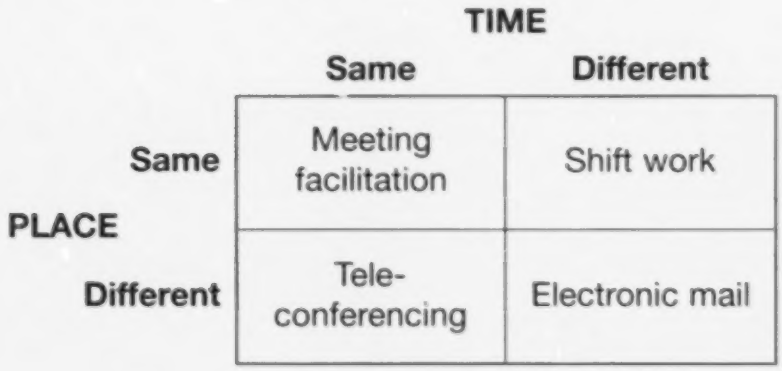

Figure 1: Time and place matrix (adapted from Ref 11).

3. Organisational information infrastructure case studies

During 1995, a team of researchers from the Graduate School of Management at the University of Western Australia studied four Australian government agencies as they planned, developed or refined their presence on the Internet as online information providers. These agencies were pioneers in Internet information provision, and lessons learned from them gave us an insight into the organisational capabilities required for successful online provision of internal information. The agencies took a variety of approaches to Internet information provision, as

the following profiles indicate. The profiles, summarised in Table 1, describe each agency and its Internet presence at the time of the case study. Despite differences in their mission, size, structure and approach to Internet information provision, common lessons can be drawn from their experiences.

The Small Business Agency (SBA) works with new and existing small businesses to develop small business throughout the state. The agency has 40 staff. The agency's advisors provide information to people who run or who plan to set up small businesses in metropolitan and country locations. They provide advice by telephone, at in-person interviews, and through brochures distributed at trade shows and at agencies throughout the state. The SBA Internet presence was established by the agency's information manager who saw an opportunity to distribute information inexpensively to the agency's geographically distributed clientele. The information manager established the agency's presence by taking extracts from existing print publications, and modifying them so that they contained attractive navigational graphics and could be read on the World Wide Web. The Internet site was initially mounted on a PC within the agency's offices and connected to the Internet by modem.

The Commerce Development Agency (CDA) works with businesses to develop and enhance national and international trade relations. The CDA has 210 staff, located in Australia and other countries. The agency provides information to potential investors in the state as well as to businesses that operate within the state seeking to improve their international trade. Information is provided through formal training, brochures, introductions to approved advisors, and in telephone and face to face meetings. The agency represents the state at national and international trade fairs, and distributes promotional documents at these events. The CDA's Internet presence was established by the agency's public relations manager who saw the Internet as an opportunity to promote the state internationally as technologically advanced. The first material on the Internet site was adapted from promotional material developed for a significant international technology exhibition. The CDA Internet site was initially mounted on a server connected to the agency's Novell Netware local area network.

The Resource Management Agency manages use of the state's natural resources. This is a large agency, with 800 staff in five major divisions. The agency has had several Internet champions. At the time of the case study, the technical information services manager, who had successfully established an Internet site for another large government agency, was planning to launch an extended Internet site. The new site would provide access to information about the agency and the state's natural resource. In addition, it would permit registered users to interrogate the agency's databases of public information about resource use and about issued licenses and permits. The site was technically advanced, with information accessed from several internal systems served through a Sun server, with the security shield of an additional Sun server that acted as a firewall to prevent unauthorised access. The information on the site came from existing agency print publications and online databases.

We included a fourth agency in the project. This agency, the Rates Valuation Agency (RVA), had not developed an Internet presence, but the agency's information technology manager had identified an opportunity for online information provision to the many organisations and individuals that sought information about the rated values of the state's land. The RVA has 180 staff, technologically-aware management, and a well-integrated information management infrastructure. This agency's systematic approach to establishment of an Internet presence provided a comparitor for the more entrepreneurial approaches taken by the other agencies.

4. Organisational capability for online information provision

The GSM team identified three key elements of organisational information infrastructure or capability for Internet information provision (Figure 2): organisational structure and processes; information technology infrastructure; and information management infrastructure. The three elements of capability are interdependent. Furthermore, the conditions for establishing an Internet presence successfully are likely to be quite different from the conditions for successfully operating and maintaining that presence.

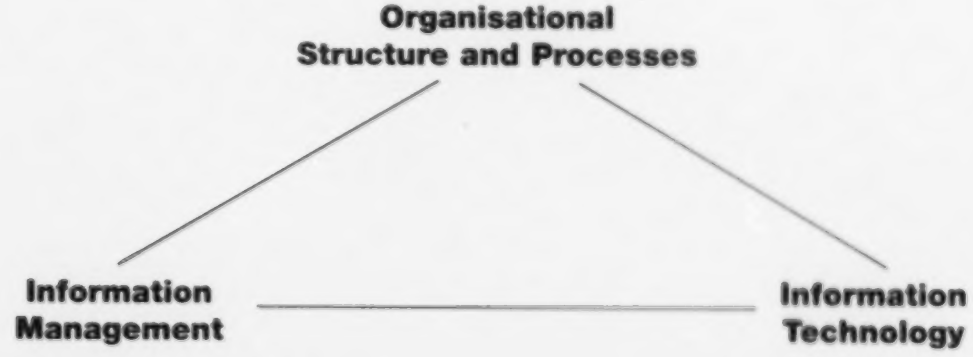

Figure 2: Capability for successful information provision using computer-based communication networks.

Table 1: Summary case agency information.

Agency (a)	Mission	Size (b)	Technology for Internet information provision	Internet information provision project leader	Information provided online from the Internet
Small Business Agency (SBA)	develop small business throughout the state	40	PC and modem	information manager (librarian/database administrator/network administrator	information about the agency and its services(extracts from existing print materials)
Commerce Development Agency (CDA)	support the state's business organisations as they develop and enhance national and international trade relations	210	modem connected to office local area network (Novell Netware)	public relations manager	information about the agency, and copies of promotional material for the state (from existing print publications, with supplementary introductions for the Internet site)
Resource Management Agency (RMA)	license, monitor, and manage use of the state's natural resources	800	Sun server with separate firewall	technical information services manager	information about the agency (from existing print publications, with supplementary introductions for the Internet site)
Rates Valuation Agency (RVA)	value land and properties for rating and taxation	180	none	information technology manager	none

Notes: (a) agency pseudonym, (b) approximate full-time equivalent staff

4.1. Establishing an Internet presence

Internet-based information technologies such as the World Wide Web have three key advantages that make initial establishment of an Internet presence attractive to, and possible for, individual entrepreneurial members of an organisation's staff. Internet technologies are scaleable, they have a low entry cost, and concerns about the technology itself tend not to surface during establishment.

It is possible to establish an Internet presence with a PC, a modem, an account with an Internet service provider and a telephone or other telecommunications link. Quite serviceable software is available free of charge from the Internet. For a commercial organisation in Australia, the direct operating costs of this connection are less than A$1500 a year. The Small Business Agency established its Internet presence with a technical set up just like this. It is equally possible to establish an Internet connection from most large organisational computer systems.

Organisations that have existing printed information, particularly if that information already exists in a digital form, can transfer the information with a little effort into simple text form or hypertext mark-up language (HTML) that can be read with any World Wide Web browser. Many Internet information providers have established their online presence by transferring existing published or written documents to their Internet server. This is a common approach for organisations that have well established mission statements, descriptions of activities, and policy or educational documents. This approach has the advantage that the information provided is readily available, and already approved for distribution to the public. If it is out of print or costly to distribute, it can be made available to people who would otherwise not have access to it.

The ease with which the initial set of information can be made available online through Internet technologies is not dampened by major technological concerns. Concerns about security have receded as information technology managers have learnt to construct effective firewalls to screen unauthorised access, and to use effective encryption technologies (Ref 12).

Many organisations that have established an Internet presence have a internal champion or 'intrapreneur', who has access to the technology and the content, and the ability to convince decision makers to invest in a pilot site. The Internet intrapreneurs we met during our research were more concerned with establishing an Internet presence than with maintaining the information for longer-term use.

4.2. Maintaining a successful network presence

Successful online provision of internal information requires more than an intrapreneur with some existing technology and content. Successful online information provision makes available up-to-date and accurate information that is needed by members of the organisation, its clients and suppliers, and/or members of the public. The online presence should enhance the organisation's ability to fulfil its mission and to meet its objectives. It should meet current standards at lower cost, and enable the agency to exceed current standards without increasing costs. Online information and service provision should be fully integrated into the organisation's information and service provision functions. It should be supported by appropriate information technology, information management infrastructure, and organisational structures and processes, including people with the ability and skills to maintain secure, accurate and current information and information technology services.

At present, only those organisations that have been established specifically to provide online information and services approach these standards. Network information resources developed by existing organisations seldom meet them. You do not have to visit many Internet World Wide Web sites to find several that are under development or out of date — or both under development and out of date! Many organisations that have mounted existing print documents on the Internet have structured and presented information in a way that does not match the strengths or the limitations of computer screens and underlying indexing and searching technology. Problems include graphics that do not fit on a screen, contents buttons that do not appear on the first screen that the user sees, long documents through which users are expected to scroll without guidance, and colours that blend into the background so that some words or letters are unreadable.

From an organisational perspective, online provision of internal information takes advantage of a new communication medium. The global information infrastructure is a computer-based communication network that can be seen as a complement to other organisational communication media such as face to face meetings, television and radio broadcasts, print material, telephones and facsimiles machines. Just as decisions are made to incorporate each of the other media into the organisation's practices and programmes for information provision, so computer-based communication media can be included in these programmes. Computer-based communications should be integrated with other modes of communication. For this to happen, an organisation's staff must become as familiar and confident with computer-based communications media as they are with other media. This requires education and training in the medium as a communications medium rather than training in operation of the information technology.

To integrate network-based information and service provision into the day-to-day work of organisations, staff responsible for information and service provision must have physical access to the technology. A simplistic approach would be to enable existing desktop computers to access the Internet, or to provide staff without desktop computers with computers that provide Internet access. Without a clear programme for networked information and service provision, this approach would help with electronic mail communication and information gathering, but not with information provision. The time and place matrix (Figure 1) shows that the nature of requests for information and service, and the way in which they are fulfilled, can be altered dramatically if

networked computers are used to provide information effectively to people from many locations who seek information at any time of day.

For printed policy manuals to be replaced by electronic manuals, each member of staff must have convenient access to a terminal and skills to retrieve the information. Behind the scenes, staff preparing the manuals must have skills in electronic information management, ranging from design to version control and other records management skills. A mechanism will be needed to alert staff to changes to the electronic manual; they will no longer have the visual cue contained in a set of updates. Technical staff must be competent at maintaining a secure and reliable system.

While it is possible to fit electronic mail communication and use of networks for information gathering into organisational structures and practices without re-design, use of the networks for information provision has the potential to affect the entire structure and process operation of an organisation. Electronic networks provide an opportunity to improve services and organisational structures radically. Managers who are aware of their organisation's strategy, the capabilities of the medium, the needs of their clients and the needs of shareholders, government or other stakeholders may find a solution to long running problems, provided they have the courage to engineer radical change.

Even if radical change is not called for, online information provision demands changes to information processes. It is not enough for an intrapreneur to gather and mount existing information on a network server: the information must be kept up to date and accurate. It must present an accurate and positive view of the organisation to the community. The information should be presented in a way that suits the technology and that enables people to obtain information with little difficulty. This requires networked information provision to be integrated into the organisation's information provision functions and therefore its day-to-day information flow. Where networked publication and distribution replaces print publication and distribution of information, staff formerly employed in print distribution roles will need to be retrained to meet the requirements of electronic publication, including layout and design, updates and version control. Staff in service and information provision roles will need to know what information is on the network, how to obtain it, and how to help others to obtain it.

The agencies in our studies expect Internet information provision to reduce the need for over-the-counter information services. Staff who provide counter service now will have to be re-deployed, and possibly re-trained to maintain and provide information in electronic form. To maintain even an apparently small site will have staffing and organisational ramifications.

The information technology and information infrastructure must support changes in use and demand. Information technology staff must be capable of maintaining secure access during the hours the service is provided — possibly 24 hours a day, seven days a week. They must be able to meet demand for access while at the same time maintaining appropriate levels of security. Records managers and information technology staff must work together to ensure that different versions of documents and information are appropriately controlled, and that appropriate records of electronic transactions and correspondence are kept.

5. Summary and conclusion

Online provision of organisational information, using computer-based communication technologies such as the Internet (or new technologies that develop to take advantage of the global information infrastructure), will become as commonplace as other forms of organisational communication. Even if they do not establish themselves as online information providers in the short term, organisations should begin to develop the capability to do so now.

Successful online information provision requires organisational, information technology and information management capability. From an organisational point of view, the key issues to be resolved concern organisational structure and information management rather than the technology itself.

Managers who want to guide their agencies through the period of change that will accompany development of online provision of internal information will need to develop strategies for personal and organisational development. We recommend the following strategies:

(a) *Develop in managers an understanding of the new information and business environment*. Participate in education and training in the role that global and organisational information infrastructures play as communication media, in business process re-engineering, and in change management.

(b) *Develop managerial, professional and operational staff understanding of the organisational role of computer-based communication media*. All organisational personnel will need a new understanding of the role of computer-based communication media and their relationship to other forms of communication currently in use. Education should focus on how computer-based communication media can be used in organisational communication, rather than training in operation of the hardware and software that form the information technology infrastructure for computer-mediated communication.

(c) *Re-engineer business processes whose end-product is information provision*. Re-engineer organisational processes to incorporate online information provision in day-to-day work processes. In most organisations, information products are the end-product of processes that involve revision and reformatting of information that originates early in the process. Online information provision permits information to be provided to the organisation's staff, clients, suppliers, stakeholders and others as it becomes available, without the significant further processing currently required to deliver information from given locations staffed during set hours, or in the form of a printed document with an acceptable shelf life.

(d) *Develop policies and procedures for management of online information about the organisation.* Information management policies may be based on organisational policies for issue and version control, information security and record retention, where they exist. If the organisation does not have such policies, they will be needed in an electronic environment where the content of an information resource can be changed much more quickly and easily than that of printed resources.

(e) *Provide appropriate staff with suitable information technology and skills for online information access and provision.* The staff who provide online information form an important component of the organisation's information infrastructure. They will need access to suitable technology for online information, and instruction in its use. They will also need training in information management, which includes implementation of the organisation's information management policies and procedures, including how to maintain the quality of online information.

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